TECHNICAL MEMORANDUM

Date:	December 6, 2016	**Project No.:**	913-1101-010.001
To:	Jason Maughan	**Company:**	P4 Production, L.L.C.
From:	Michael Klisch and David Banton		
cc:	Eric Adams – GAI Redmond Paul Pigeon – GAI Denver	**Email:**	dbanton@golder.com
RE:	**SAMPLING WORK PLAN FOR ADDITIONAL SAMPLING TO SUPPORT NPDES PERMIT RENEWAL APPLICATION**		

This Work Plan provides information on additional water quality sampling to support the National Pollutant Discharge Elimination System ("NPDES") permit renewal application submitted by P4 Production, L.L.C. ("P4") for its Soda Springs, Idaho plant ("the Plant"). Samples were collected in June 2016 for analysis of constituents listed on Form 2C Section V of the NPDES Permit application. For a number of constituents, there is only one analysis at each sample location.

Collection of additional water quality samples will provide a more robust data set for evaluation of background water quality and effluent water quality.

1.0 SAMPLE LOCATIONS

Surface water, non-contact cooling water, and groundwater quality samples will be collected to provide additional analytical data to inform the processing of P4's NPDES permit renewal application. The sample locations will include the following locations that were sampled in June 2016:

- Surface Water:
  - Soda Creek upstream of P4's outfall (SC-01).
  - Soda Creek at the power canal diversion weir downstream of P4's outfall (SC-02).
  - The power return canal about 3,700 feet downstream of P4's outfall (PR-01).
- Non-Contact Cooling Water:
  - Non-contact cooling water pond inlet.
  - P4's outfall to Soda Creek.
- Groundwater:
  - Plant groundwater wells ("Production Wells") PW-01, PW-02, PW-03, and PW-04.

The sample locations are shown on Figure 1.

2.0 SAMPLE CONSTITUENTS

Table 1 summarizes the constituents to be sampled at each location, analytical methods, holding times, and the method detection and method reporting limits for each constituent.

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3.0 SAMPLE COLLECTION AND ANALYSIS

Groundwater, surface water, and non-contact cooling water samples will be collected in accordance with the Work Plan for groundwater and surface water quality sampling and associated Quality Assurance Project Plan (QAPP)[1] previously prepared for the annual sampling under the EPA-approved Five-Year Superfund Review process. This includes:

- Collection of field duplicate samples at a rate of one duplicate sample per 20 samples.
- Collection of split laboratory samples at a rate of one split sample per 20 samples.
- Collection of one field blank per sampling event.

No equipment blanks will be collected because all sampling will be completed using the permanently installed pumps in the Plant Production Wells or will be collected as grab samples directly from surface water or non-contact cooling water.

Field water quality parameters (pH, specific conductance, temperature, turbidity, dissolved oxygen, and redox potential) will be measured prior to sample collection at each sampling location (Table 2).

The analyses of all constituents will be completed by SVL Analytical Inc. of Kellogg, Idaho, and its subcontract laboratories (for analysis of radionuclides and oil and grease), with the exception of fecal coliform analysis which will be completed by IAS Envirochem of Pocatello, Idaho because of the short holding time for fecal coliform. Split samples will be analyzed by Analytical Resources Inc. of Seattle, Washington. Because several other constituents have short holding times (48 hours), samples will be either delivered daily to the laboratory (for fecal coliform analysis) or shipped daily from the Plant or a FedEx shipping location to the laboratory.

The sampling will include an assessment of conditions at the time of, and preceding, sample collection, including:

- Precipitation and changes in streamflow in Soda Creek (using a temporary staff gauge).
- Any changes in Plant operations.
- Changes in operations of the Plant Production Wells.
- Non-contact cooling water discharge rates and changes in the non-contact cooling water pond stage (based on P4 data).

Flows in the power and irrigation canal, non-contact cooling water discharge, and Soda creek upstream of the non-contact cooling water discharge will be estimated as follows:

- Flow in the power and irrigation canal will be estimated using a flume located about 230 feet downstream of the diversion weir (station SC-02). The flume dimensions and water depths in the canal will be measured and an equation developed to estimate flow.

[1] Golder Associates Inc. Groundwater and Surface Water Quality Sampling Work Plan, Monsanto Soda Springs, Idaho Plant. April 28, 2015. Approved by EPA on May 11, 2015.

- Discharge from the non-contact cooling water is measured daily by P4. The discharge data on the sampling dates will be provided by P4.
- Flow in Soda Creek upstream of the non-contact cooling water discharge will be estimated by subtracting the non-contact cooling water discharge from the estimated flow in the canal. Note: Substantially all of the flow in Soda Creek is diverted to the City of Soda Springs penstock in a canal located approximately 60 feet downstream of P4's outfall to Soda Creek. A small amount of water leaks to Soda Creek downstream of this diversion via flashboards. This leakage is typically less than 0.5 cubic feet per second (cfs) and will be visually estimated or measured if higher amounts of water are allowed to flow into Soda Creek.

Flows in the Plant Production wells will be measured using the flowmeters currently installed in PW-02 and PW-01 or estimated from pump curves and pump operational schedules in PW-01 and PW-04 because the installation of flowmeters in these has not been completed as of mid-November 2016. The pump curves and pump operational schedules for these wells during each sampling event will be provided by P4.

The analytical data will be validated in accordance with the QAPP.

3.1 Additional Sampling – Phosphorus

Additional water quality samples will be collected from Soda Creek and springs to characterize phosphorus concentrations in the vicinity of the Plant. At each sampling location, field water quality parameters (Table 2) will be measured and samples collected for total and dissolved phosphorus and orthophosphate. Flow measurements will be made in springs and surface water using either a bucket and stopwatch or a Swoffer current meter provided it is safe to enter the water body.

The additional sampling locations are shown on Figure 1 and are as follows:

- Surface Water
  - Soda Creek upstream of Soda Reservoir at the quartzite quarry road crossing
  - Soda Creek downstream of Soda Reservoir below the first power diversion
  - Soda Creek upstream of Hooper Spring
  - Soda Creek downstream of Hooper Spring – above the power return from the first power plant
  - Power canal return from first power plant
- Springs
  - Hooper Spring (upstream of P4's outfall)
  - Formation Spring – location to be determined from field survey and access (City of Soda Springs water supply source located to the northeast of the Plant)
  - Ledger Springs A, B, and C (City of Soda Springs water supply source located to the southeast of the Plant)
  - Doc Kackley Spring (upstream of P4's outfall)
  - Marsh Spring (upstream of P4's outfall)

Access to Formation Spring and Ledger Springs will be coordinated with the City of Soda Springs.

3.2 Sampling Schedule

The water quality sampling will include three rounds of sampling. Each round of sampling will include the collection of three samples from each sampling site. One sample per day will be collected over a three-day period from each site.

The sampling schedule is dependent on Plant operational conditions and staffing, and is tentatively identified as follows:

- **December 2016**: Week of December 12
- **January 2017**: Week of January 9
- **February 2017**: Week of February 6

GOLDER ASSOCIATES INC.

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Senior Project Hydrogeologist

David Banton, LHG, RG
Principal Hydrogeologist

MK/DB/ks

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Table 1: Constituents, Analytical Methods, Holding Times and Method Detection and Reporting Limits

Constituent	Analytical Method	Holding Time	Method Detection Limit	Method Reporting Limit	Units
Bacteriological					
Fecal Coliform	SM 9223B	6 hours	2	2	MPN/100 ml
Radiological					
Total Alpha	E900	6 months	Varies with Sample		pCi/L
Total Beta	E900	6 months	Varies with Sample		pCi/L
Radium 226	E903	6 months	Varies with Sample		pCi/L
Radium 228	E903	6 months	Varies with Sample		pCi/L
Total Recoverable Metals					
Antimony	EPA 6020A	6 months	0.00019	0.003	mg/L
Aluminum	EPA 6010C	6 months	0.055	0.08	mg/L
Arsenic	EPA 6020A	6 months	0.00023	0.001	mg/L
Barium	EPA 6010C	6 months	0.00095	0.002	mg/L
Beryllium	EPA 6010C	6 months	0.00099	0.002	mg/L
Boron	EPA 6010C	6 months	0.0092	0.04	mg/L
Cadmium	EPA 6010C	6 months	0.00088	0.002	mg/L
Calcium	EPA 6010C	6 months	0.041	0.1	mg/L
Chromium	EPA 6010C	6 months	0.0015	0.006	mg/L
Copper	EPA 6010C	6 months	0.0026	0.01	mg/L
Iron	EPA 6010C	6 months	0.039	0.06	mg/L
Lead	EPA 6020A	6 months	0.000075	0.003	mg/L
Magnesium	EPA 6010C	6 months	0.078	0.2	mg/L
Manganese	EPA 6010C	6 months	0.0024	0.004	mg/L
Mercury	EPA 7470	28 days	0.000053	0.0002	mg/L
Molybdenum	EPA 6010C	6 months	0.0043	0.008	mg/L
Nickel	EPA 6010C	6 months	0.0026	0.01	mg/L
Potassium	EPA 6010C	6 months	0.19	0.5	mg/L
Selenium	EPA 6020A	6 months	0.00024	0.005	mg/L
Silver	EPA 6010C	6 months	0.0016	0.005	mg/L
Sodium	EPA 6010C	6 months	0.14	0.5	mg/L
Thallium	EPA 6020A	6 months	0.000034	0.001	mg/L
Vanadium	EPA 6010C	6 months	0.0015	0.005	mg/L
Zinc	EPA 6010C	6 months	0.0028	0.01	mg/L
Anions/Nutrients					
Bromide	EPA 300.0	28 days	0.03	0.1	mg/L
Chloride	EPA 300.0	28 days	0.85	5	mg/L

Constituent	Analytical Method	Holding Time	Method Detection Limit	Method Reporting Limit	Units
Fluoride	EPA 300.0	28 days	0.018	0.1	mg/L
Sulfate as SO_4	EPA 300.0	28 days	0.78	7.5	mg/L
Ammonia as N	EPA 350.1	28 days	0.023	0.03	mg/L-N
Nitrate/Nitrite as N	EPA 353.2	28 days	0.024	0.05	mg/L-N
Total Kjeldahl Nitrogen (as N)	EPA 351.2	28 days	0.23	0.5	mg/L-N
Organic Nitrogen	Calculation	28 days	0.253	0.53	mg/L-N
Total Phosphorus (total/dissolved)	SM 4500-P-E	28 days	0.005	0.01	mg/L
Orthophosphate (total/dissolved)	SM 4500-P-E	48 hours	0.005	0.01	mg/L
Bicarbonate Alkalinity	SM 2320B	14 days	NA	1	mg/L
Carbonate Alkalinity	SM 2320B	14 days	NA	1	mg/L
Total Alkalinity	SM 2320B	14 days	NA	1	mg/L
Sulfite	Hach Test Kit	Field Analysis	NA	NA	mg/L
Sulfide	SM4500 $S^{+2}F$	7 days	0.024	0.05	mg/L
Other Constituents					
Hardness	SM 2340B	6 months	0.424	1.07	mg/L
Total Dissolved Solids	SM 2540 C	7 days	NA	10	mg/L
Total Suspended Solids	SM 2540 D	7 days	NA	5	mg/L
Color	SM 2120B	48 hours	NA	5	mg/L
Biochemical Oxygen Demand	SM 5210B	48 hours	2	2	mg/L
Chemical Oxygen Demand	EPA 410.4	28 days	2	5	mg/L
pH	SM 4500 H+B		0.0019	0.01	mg/L
Total Cyanide	EPA 335.4	14 days	0.424	1.07	mg/L
Organic Constituents					
Total Organic Carbon	SM 5310B	28 days	0.33	1	mg/L
Oil and Grease	SM 1664	28 days	0.5	1	mg/L

Notes:
NA – Not applicable
MPN - most probable number
ml - milliliters
pCi/L - picocuries per Liter
mg/L - milligrams per Liter

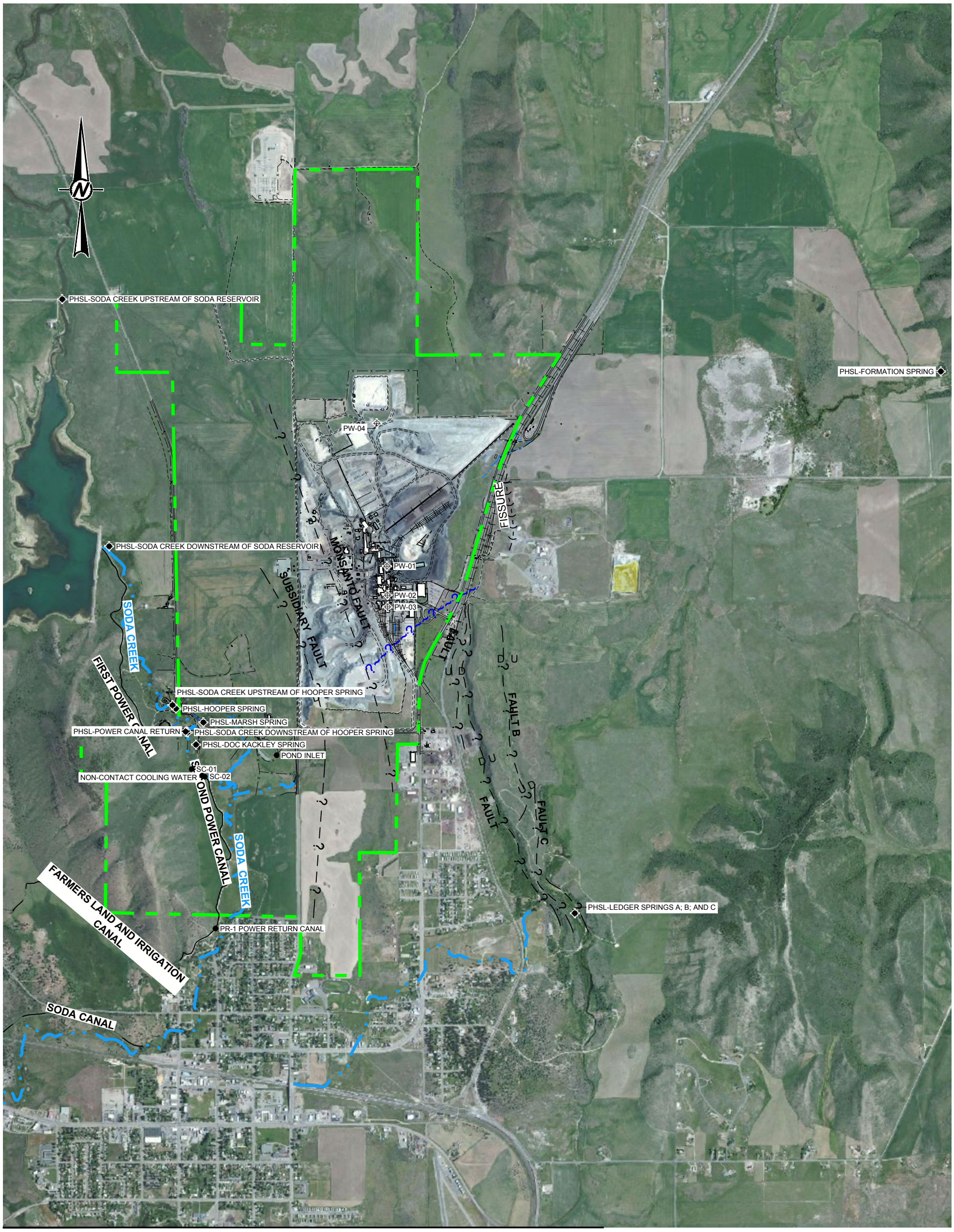
Table 2: Field Water Quality Parameters

Constituent	Analytical Method	Holding Time		Units
pH	Field Meter	Immediate Analysis		s.u.
Specific Conductance	Field Meter	Immediate Analysis		µS/cm
Dissolved Oxygen	Field Meter	Immediate Analysis		mg/L
Temperature	Field Meter	Immediate Analysis		°C
Redox Potential	Field Meter	Immediate Analysis		mV
Turbidity	Field Meter	Immediate Analysis		NTU

Notes:
s.u. – Standard Units
µS/cm – microSiemens per centimeter
mg/L – milligrams per Liter
°C - Degrees Celsius
mV – Millivolts
NTU – Nephelometric Turbidity Units

FIGURE

Path: \\redmond\geomat$\geomatics\Monsanto\Idaho\99_PROJECTS\9131101010_WaterTreatmentSupport\001_NPDES_Sampling\02_PRODUCTION\DWG\ | File Name: 9131101010_001_001.dwg



LEGEND

FAULT	IRRIGATION CANAL
FISSURE	GROUNDWATER FLOW REGION BOUNDARY
UBZ-1 — GROUNDWATER ZONE	MORMON CREEK — SURFACE WATER SAMPLE LOCATION WITH NAME
INSTITUTIONAL CONTROL BOUNDARY	PW-1 — PRODUCTION WELL SAMPLE LOCATION WITH NAME
CREEK	PHSL01 — PHOSPHOROUS SAMPLE LOCATION WITH NAME
POWER CANAL	

0 600 1200
1" = 1200' FEET

NOTES

1. NAD83 IDAHO STATE PLANES, EAST ZONE, US FOOT.
2. AERIAL PHOTO FROM GOOGLE EARTH (8/2/2013) AND COURTESY OF BING MAPS, MICROSOFT CORPORATION, 2016

CLIENT
P4 PRODUCTION LLC

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-11-11
PREPARED	REDMOND
DESIGN	-
REVIEW	MK
APPROVED	DB

PROJECT
NPDES PERMITTING SUPPORT
SODA SPRINGS, IDAHO

TITLE
SAMPLE LOCATION MAP

PROJECT No.	PHASE	Rev.	FIGURE
9131101-010	001	B	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
1 in
0